



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/810,784	03/26/2004	Hung Chih Chen	008698 / 556001	9643
26185	7590	08/24/2006		
FISH & RICHARDSON P.C. P.O. BOX 1022 MINNEAPOLIS, MN 55440-1022				
			EXAMINER MACARTHUR, SYLVIA	
			ART UNIT	PAPER NUMBER

1763

DATE MAILED: 08/24/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/810,784	CHEN ET AL.	
	Examiner	Art Unit	
	Sylvia R. MacArthur	1763	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 25 May 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) 29 and 30 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-12, 16-18 and 21-28 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 11 April 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Allowable Subject Matter

1. The indicated allowability of claims 13-15, 19, and 20 are withdrawn in view of the newly discovered reference(s) to Perlov et al (US 5,964,653) in view of Chen et al. Rejections based on the newly cited reference(s) follow.

Claim Rejections - 35 USC § 103

2 The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-12, 16-18, and 21-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Perlov et al (US 5,964,653) and Chen et al (US 2004/0005842).

Regarding claims 1, 24, and 28: Perlov et al teaches a carrier head with a gimbal mechanism wherein the apparatus comprises a carrier head 200 for CMP comprising a base 204, a flexible membrane 210 (includes including flaps 282a-282c), the flexible membrane comprises a central portion (bordered by flaps 282a) with a substrate receiving portion, the edge of outermost flap 282c provides a perimeter portion, and a flap 282b extending from the inner surface of the central portion. The flap dividing a volume between the flexible membrane and the base into a plurality of chambers, see Fig. 5. Perlov et al fails to teach a laterally extending first section and an angled section.

Chen et al teaches a carrier head with a flexible membrane wherein the flexible membrane includes a flap with a laterally extending first section and an angled second

section. The motivation to provide the flaps of Perlov et al with a different shape is that the laterally extending section provides a consistent force along the lateral direction while the angled section reduced the force on the substrate in a lateral direction, thus a pressure differential is produced between the carrier head and the substrate providing more efficient polishing. Thus, it would have been obvious for one of ordinary skill in the art at the time of the claimed invention to provide a laterally extending first section and an angled section in the apparatus of Perlov as suggested by Chen et al.

Regarding claim 2: The carrier head of claim 1, wherein the first section extends substantially, see Fig.1 of Chen et al element 126.

Regarding claim 3: The carrier head of claim 1, wherein the second section has a horizontal loading area sized so as to react out a portion of the downward force on the first section that is created by a pressure in a chamber between the flexible membrane and the base but is not reacted out by the base, see Fig. 1 of Chen et al and [0008].

Regarding claims 4 and 26: The carrier head of claim 1, the modification of Perlov et al and Chen et al fail to teach wherein second section has a horizontal loading area about one-half that of the first section.

However, Chen et al does teach the loading area is reduced due to the angular shape. The exact amount of reduction is a matter of optimization. Note that the amount of loading area is a cause effective variable known in the art to effect the overall polishing result. It is well settled that determination of optimum values of cause effect variables such as these process parameters is within the skill of one practicing the art. In re Boesch, 205 USPQ 215 (CCPA 198).

Regarding claim 5: The carrier head of claim 1, wherein a point of attachment of the second section of the flap to the central portion is substantially vertically aligned with a midpoint of the first section between a point of attachment of the first section to the base and a point of attachment of the first section to the second section, see Fig. 5 of Perlov et al.

Regarding claim 6: The carrier head of claim 1, wherein the perimeter portion is directly connected to the base, see Fig. 5 of Perlov et al.

Regarding claim 7: The carrier head of claim 1, Perlov et al further comprises a retaining ring 208 to surround a substrate on the substrate receiving surface.

Regarding claim 8: The carrier head of claim 7, wherein the first section is sufficiently vertically movable so that a pressure profile applied to a substrate is substantially insensitive to retaining ring wear, teaches a downward load (vertical direction), col. 8 lines 33-52.

Regarding claim 9: The carrier head of claim 1, wherein the flexible membrane includes a plurality of flaps, each flap including a laterally extending first section and an angled second section extending beneath the first section (a plurality of flaps is illustrated in Fig. 1 of Chen et al).

Regarding claim 10: The carrier head of claim 9, wherein the flaps are arranged annularly and concentrically, see Fig. 1 of Chen et al.

Regarding claim 11: The carrier head of claim 10, wherein the flaps are configured to provide three independently pressurizable chambers, 160, 162, 164.

Regarding claim 12: The combination of Perlov et al and Chen et al fail to teach that the carrier head of claim 1, wherein the first section and the second section have about the same thickness. The actual dimensions of the first and second section of the carrier head is a matter of optimization. It is well settled that determination of optimum values of cause effective variables such as the process parameters is within the skill of one practicing in the art, in re Boesch. The motivation to design the section having the same thickness is to ensure that the pressure distribution along the substrate will not damage or break the wafer during processing. The same thickness ensures the same pressure in the complemented area of the substrate. Thus, it would have been obvious for one of ordinary skill in the art at the time of the claimed invention to design the sections of the carrier head have the same thickness.

Regarding claim 16: The carrier head of claim 1, wherein the flap includes a vertical third section between the laterally extending first section and the angled second section, see Fig. 1 of Chen et al.

Regarding claim 17: The carrier head of claim 16, wherein the flap includes a vertical fourth section between the angled second section and the central portion, see Fig. 1 of Chen et al.

Regarding claim 18: The carrier head of claim 1, wherein the flap includes a vertical section between the angled second section and the central portion, see Fig. 1 of Chen et al.

Regarding claim 21: The carrier head of claim 1, wherein the plurality of chambers provide independently adjustable pressures to an associated plurality of regions of the

substrate receiving surface, and the flexible membrane is configured to provide a substantially uniform transition between different pressures in adjacent regions, see col. 6 lines 13-22 of Perlov et al.

Regarding claim 22: The carrier head for chemical mechanical polishing of a substrate, comprising: a base; and a flexible membrane extending beneath the base to provide a substrate receiving surface and define a plurality of chambers to provide independently adjustable pressures to an associated plurality of regions of the substrate receiving surface, the flexible membrane configured to provide a substantially uniform transition between different pressures in adjacent regions, see col. 11 lines 48-58 of Perlov et al.

Regarding claim 23: The carrier head of claim 22, wherein the flexible membrane configured to provide a substantially monotonic transition between different pressures in adjacent regions, see col. 12 lines 1-37 of Perlov et al dependent upon the presence of a substrate.

Regarding claim 25: The carrier head of claim 24, wherein the second section has a horizontal loading area sized so as to react out a portion of the downward force on the first section that is created by a pressure in one of the plurality of chambers but is not reacted out by the base, see Fig.5 of Perlov et al

Regarding claim 27: The carrier head of claim 25, wherein a point of attachment of the second section of the flap to the central portion is substantially vertically aligned with a midpoint of the first section between a point of attachment of the first section to the base and a point of attachment of the first section to the second section, see Fig. 5 of Perlov et al.

Response to Arguments

4. Applicant's arguments with respect to claims 1-12, 16-18, and 21-28 have been considered but are moot in view of the new ground(s) of rejection. The rejection of Perlov et al (teaching at least one flap wherein the flap creates a plurality of chambers) as modified by Chen et al with a flap that has a laterally extending section and an angular section obviates the present invention.

Conclusion

5. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. The apparatus of Perlov et al teaches the flap bounding a same chamber of the plurality of chambers.

Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.


Art Unit: 1763

6. ~~5~~ Any inquiry concerning this communication or earlier communications from the
examiner should be directed to Sylvia R. MacArthur whose telephone number is 571-272-1438.

The examiner can normally be reached on M-F during the hours of 8:30 a.m. and 5 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on 571-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


Sylvia R MacArthur
Patent Examiner
Art Unit 1763

August 7, 2006


PARVIZ HASSANZADEH
SUPERVISORY PATENT EXAMINER